What is claimed is:

1. Grinding media, comprising a multi-carbide material consisting essentially of carbon and at least two different carbide-forming elements wherein said multi-carbide material is formed into shaped grinding media ranging in size from 0.5 micron to 100 mm in diameter.

2. Grinding media according to claim 1, wherein said carbide-forming elements are selected from the group consisting of chromium, hafnium, molybdenum, niobium, rhenium, tantalum, thallium, titanium, tungsten, vanadium, and zirconium.

3. Grinding media according to claim 1, wherein said grinding media consists essentially of a multi-carbide material consisting essentially of carbon and at least two different carbide-forming elements wherein said multi-carbide material is formed into shaped grinding media ranging in size from 0.5 micron to 100 mm in diameter.

4. Grinding media according to claims 1, 2, or 3 wherein said multi-carbide material further includes a carbide-forming element in its elemental state.

5. Grinding media according to claims 1, 2, or 3 wherein said multi-carbide material further includes at least one of said carbide-forming elements of said multi-carbide material in its elemental state.

6. Grinding media according to claim 1, wherein said grinding media consists essentially of titanium, tungsten, and carbon, in the ratios of from about 10 to 90 at% tungsten, from about 2 to 97 at% titanium, and the balance carbon.

7. Grinding media according to claim 1, wherein said grinding media consists essentially of about 10 to 40 at% carbon; from about 5 to 50 at% titanium, and the balance being tungsten.

8. Grinding media according to claim 1, further comprising

a multi-carbide material consisting essentially of from about 10 to 40 at% carbon, from about 5 to 50 at% titanium, and the balance being tungsten; and

at least one material taken from the group consisting of molybdenum, chromium, and rhenium;

wherein said at least one material is in an amount from 0 to about 20 at%, with the tungsten remaining in the composition being not less than 10 at%.

9. Grinding media according to claim 1, comprising a multi-carbide material consisting essentially of from about 20 to 30 at% carbon; from about 5 to 50 at% titanium; from about 0 to 30 at% of at least a first material from the group consisting of rhenium, zirconium, hafnium and molybdenum; from about 0 to 10 at% of at least a second material taken from the group consisting of vanadium, niobium and tantalum; from about 0 to 20 at% chromium; with the balance, but not less than 10 at%, being tungsten.

10. Grinding media according to claim 1, comprising a multi-carbide material consisting essentially of:

(a) from about 15 to 60 at% titanium and first alloying substituents, wherein said first alloying substituents consist of hafnium, niobium, tantalum and zirconium; and wherein titanium, titanium and niobium, or titanium and niobium and tantalum are present from 0 to 20 at%; wherein titanium or titanium and zirconium are present from about 0 to 10 at%; and wherein titanium or titanium and hafnium are present from about 0 to 30 at%; and the balance, if any, being titanium;

(b) from about 3 to 47 at% tungsten and second alloying substituents, wherein said second alloying substituents consist of chromium, molybdenum, vanadium, tantalum and niobium; wherein tungsten or tungsten and chromium are present from about 0 to 5 at%; wherein tungsten or tungsten and molybdenum are present from about 0 to 25 at%; wherein tungsten or tungsten and vanadium are present from about 0 to 5 at%; and wherein tungsten, tungsten and tantalum, tungsten and niobium, or tungsten and tantalum and niobium are present from about 0 to 20 at%; and the balance, if any, being tungsten;

(c) carbon from about 30 to 55 at%;

(d) wherein the atomic percentages of niobium and tantalum, each alone or in combination, never exceed 20 at%; and

(e) wherein the total at% of all constituents is 100 at%, all of the constituents of the alloy being of normal commercial purity.

11. Grinding media according to claims 1, 2, 3, 6, 7, 8, 9, or 10 , wherein said shaped media are shaped as spheres.

12. A method for making grinding media, comprising the step of forming said media from a multi-carbide material consisting essentially of carbon and at least two different carbide-forming elements wherein said multi-carbide material is formed as grinding media for use in a media mill.

13. A method according to claim 12, wherein said carbide-forming elements are selected from the group consisting of chromium, hafnium, molybdenum, niobium, rhenium, tantalum, thallium, titanium, tungsten, vanadium, and zirconium.

14. A method according to claims 12 or 13 wherein said multi-carbide material further includes a carbide-forming element in its elemental state.

15. A method according to claims 12 or 13 wherein said multi-carbide material further includes at least one of said carbide-forming elements of said multi-carbide material in its elemental state.

16. A method according to claim 12, wherein said media consists essentially of titanium, tungsten, and carbon, in the ratios of from about 10 to 90 at% tungsten, from about 2 to 97 at% titanium, and the balance carbon.

17. A method according to claim 12, wherein said media consists essentially of about 10 to 40 at% carbon; from about 5 to 50 at% titanium, and the balance being tungsten.

18. A method according to claim 12, wherein said media comprises:

a multi-carbide material consisting essentially of from about 10 to 40 at% carbon, from about 5 to 50 at% titanium, and the balance being tungsten; and

at least one material taken from the group consisting of molybdenum, chromium, and rhenium;

wherein said at least one material is in an amount from 0 to about 20 at%, with the tungsten remaining in the composition being not less than 10 at%.

19. A method according to claim 12, wherein said media comprises a multi-carbide material consisting essentially of from about 20 to 30 at% carbon; from about 5 to 50 at% titanium; from about 0 to 30 at% of at least a first material from the group consisting of rhenium, zirconium, hafnium and molybdenum; from about 0 to 10 at% of at least a second material taken from the group consisting of vanadium, niobium and tantalum; from about 0 to 20 at% chromium; with the balance, but not less than 10 at%, being tungsten.

20. A method according to claim 12, wherein said media comprises a multi-carbide material consisting essentially of:

(a) from about 15 to 60 at% titanium and first alloying substituents, wherein said first alloying substituents consist of hafnium, niobium, tantalum and zirconium; and wherein titanium, titanium and niobium, or titanium and niobium and tantalum are present from 0 to 20 at%; wherein titanium or titanium and zirconium are present from about 0 to 10 at%; and wherein titanium or titanium and hafnium are present from about 0 to 30 at%; and the balance, if any, being titanium;

(b) from about 3 to 47 at% tungsten and second alloying substituents, wherein said second alloying substituents consist of chromium, molybdenum, vanadium, tantalum and niobium; wherein tungsten or tungsten and chromium are present from about 0 to 5 at%; wherein tungsten or tungsten and molybdenum are present from about 0 to 25 at%; wherein tungsten or tungsten and vanadium are present from about 0 to 5 at%; and wherein tungsten, tungsten and tantalum, tungsten and niobium, or tungsten and tantalum and niobium are present from about 0 to 20 at%; and the balance, if any, being tungsten;

(c) carbon from about 30 to 55 at%;

(d) wherein the atomic percentages of niobium and tantalum, each alone or in combination, never exceed 20 at%; and

(e) wherein the total at% of all constituents is 100 at%, all of the constituents of the alloy being of normal commercial purity.

21. A method according to claims 12, 13, 16, 17, 18, 19, or 20, further comprising the step of forming said media into shaped media ranging in size from 0.5 micron to 100 mm in diameter.

22. A method according to claims 12, 13, 16, 17, 18, 19, or 20, further comprising the step of forming said media into spheres ranging in size from 0.5 micron to 100 mm in diameter.

23. A method for making spheres for use in cladding materials, comprising the step of forming said spheres from a multi-carbide material consisting essentially of carbon and at least two different carbide-forming elements.

24. A method according to claim 23, wherein said carbide-forming elements are selected from the group consisting of chromium, hafnium, molybdenum, niobium, rhenium, tantalum, thallium, titanium, tungsten, vanadium, and zirconium.

25. A method according to claims 23 or 24 wherein said multi-carbide material further includes a carbide-forming element in its elemental state.

26. A method according to claims 23 or 24 wherein said multi-carbide material further includes at least one of said carbide-forming elements of said multi-carbide material in its elemental state.

27. A method according to claim 23, wherein said spheres consist essentially of titanium, tungsten, and carbon, in the ratios of from about 10 to 90 at% tungsten, from about 2 to 97 at% titanium, and the balance carbon.

28. A method according to claim 23, wherein said spheres consist essentially of about 10 to 40 at% carbon; from about 5 to 50 at% titanium, and the balance being tungsten.

29. A method according to claim 23, wherein said spheres comprise:

a multi-carbide material consisting essentially of from about 10 to 40 at% carbon, from about 5 to 50 at% titanium, and the balance being tungsten; and

at least one material taken from the group consisting of molybdenum, chromium, and rhenium;

wherein said at least one material is in an amount from 0 to about 20 at%, with the tungsten remaining in the composition being not less than 10 at%.

30. A method according to claim 23, wherein said spheres comprise a multi-carbide material consisting essentially of from about 20 to 30 at% carbon; from about 5 to 50 at% titanium; from about 0 to 30 at% of at least a first material from the group consisting of rhenium, zirconium, hafnium and molybdenum; from about 0 to 10 at% of at least a second material taken from the group consisting of vanadium, niobium and tantalum; from about 0 to 20 at% chromium; with the balance, but not less than 10 at%, being tungsten.

31. A method according to claim 23, wherein said spheres comprise a multi-carbide material consisting essentially of:

(a) from about 15 to 60 at% titanium and first alloying substituents, wherein said first alloying substituents consist of hafnium, niobium, tantalum and zirconium; and wherein titanium, titanium and niobium, or titanium and niobium and tantalum are present from 0 to 20 at%; wherein titanium or titanium and zirconium are present from about 0 to 10 at%; and wherein titanium or titanium and hafnium are present from about 0 to 30 at%; and the balance, if any, being titanium;

(b) from about 3 to 47 at% tungsten and second alloying substituents, wherein said second alloying substituents consist of chromium, molybdenum, vanadium, tantalum and niobium; wherein tungsten or tungsten and chromium are present from about 0 to 5 at%; wherein tungsten or tungsten and molybdenum are present from about 0 to 25 at%; wherein tungsten or tungsten and vanadium are present from about 0 to 5 at%; and wherein tungsten, tungsten and tantalum, tungsten and niobium, or tungsten and tantalum and niobium are present from about 0 to 20 at%; and the balance, if any, being tungsten;

(c) carbon from about 30 to 55 at%;

(d) wherein the atomic percentages of niobium and tantalum, each alone or in combination, never exceed 20 at%; and

(e) wherein the total at% of all constituents is 100 at%, all of the constituents of the alloy being of normal commercial purity.

32. A method according to claims 23, 24, 27, 28, 29, 30, or 31, wherein said spheres range in size from 0.5 micron to 100 mm in diameter.

33. A method for making spheres for use in surfacing material, comprising the step of forming said spheres from a multi-carbide material consisting essentially of carbon and at least two different carbide-forming elements.

34. A method according to claim 33, wherein said carbide-forming elements are selected from the group consisting of chromium, hafnium, molybdenum, niobium, rhenium, tantalum, thallium, titanium, tungsten, vanadium, and zirconium.

35. A method according to claims 33 or 34 wherein said multi-carbide material further includes a carbide-forming element in its elemental state.

36. A method according to claims 33 or 34 wherein said multi-carbide material further includes at least one of said carbide-forming elements of said multi-carbide material in its elemental state.

37. A method according to claim 33, wherein said spheres consist essentially of titanium, tungsten, and carbon, in the ratios of from about 10 to 90 at% tungsten, from about 2 to 97 at% titanium, and the balance carbon.

38. A method according to claim 33, wherein said spheres consist essentially of about 10 to 40 at% carbon; from about 5 to 50 at% titanium, and the balance being tungsten.

39. A method according to claim 33, wherein said spheres comprise:

a multi-carbide material consisting essentially of from about 10 to 40 at% carbon, from about 5 to 50 at% titanium, and the balance being tungsten; and

at least one material taken from the group consisting of molybdenum, chromium, and rhenium;

wherein said at least one material is in an amount from 0 to about 20 at%, with the tungsten remaining in the composition being not less than 10 at%.

40. A method according to claim 33, wherein said spheres comprise a multi-carbide material consisting essentially of from about 20 to 30 at% carbon; from about 5 to 50 at% titanium; from about 0 to 30 at% of at least a first material from the group consisting of rhenium, zirconium, hafnium and molybdenum; from about 0 to 10 at% of at least a

second material taken from the group consisting of vanadium, niobium and tantalum; from about 0 to 20 at% chromium; with the balance, but not less than 10 at%, being tungsten.

41. A method according to claim 33, wherein said spheres comprise a multi-carbide material consisting essentially of:

(a) from about 15 to 60 at% titanium and first alloying substituents, wherein said first alloying substituents consist of hafnium, niobium, tantalum and zirconium; and wherein titanium, titanium and niobium, or titanium and niobium and tantalum are present from 0 to 20 at%; wherein titanium or titanium and zirconium are present from about 0 to 10 at%; and wherein titanium or titanium and hafnium are present from about 0 to 30 at%; and the balance, if any, being titanium;

(b) from about 3 to 47 at% tungsten and second alloying substituents, wherein said second alloying substituents consist of chromium, molybdenum, vanadium, tantalum and niobium; wherein tungsten or tungsten and chromium are present from about 0 to 5 at%; wherein tungsten or tungsten and molybdenum are present from about 0 to 25 at%; wherein tungsten or tungsten and vanadium are present from about 0 to 5 at%; and wherein tungsten, tungsten and tantalum, tungsten and niobium, or tungsten and tantalum and niobium are present from about 0 to 20 at%; and the balance, if any, being tungsten;

(c) carbon from about 30 to 55 at%;

(d) wherein the atomic percentages of niobium and tantalum, each alone or in combination, never exceed 20 at%; and

(e) wherein the total at% of all constituents is 100 at%, all of the constituents of the alloy being of normal commercial purity.

42. A method according to claims 33, 34, 37, 38, 39, 40, or 41, wherein said spheres range in size from 0.5 micron to 100 mm in diameter.

43. A method for making spheres for use in hard body materials, comprising the step of forming said spheres from a multi-carbide material consisting essentially of carbon and at least two different carbide-forming elements.

44. A method according to claim 43, wherein said carbide-forming elements are selected from the group consisting of chromium, hafnium, molybdenum, niobium, rhenium, tantalum, thallium, titanium, tungsten, vanadium, and zirconium.

45. A method according to claims 43 or 44 wherein said multi-carbide material further includes a carbide-forming element in its elemental state.

46. A method according to claims 43 or 44 wherein said multi-carbide material further includes at least one of said carbide-forming elements of said multi-carbide material in its elemental state.

47. A method according to claim 43, wherein said spheres consist essentially of titanium, tungsten, and carbon, in the ratios of from about 10 to 90 at% tungsten, from about 2 to 97 at% titanium, and the balance carbon.

48. A method according to claim 43, wherein said spheres consist essentially of about 10 to 40 at% carbon; from about 5 to 50 at% titanium, and the balance being tungsten.

49. A method according to claim 43, wherein said spheres comprise:

a multi-carbide material consisting essentially of from about 10 to 40 at% carbon, from about 5 to 50 at% titanium, and the balance being tungsten; and

at least one material taken from the group consisting of molybdenum, chromium, and rhenium;

wherein said at least one material is in an amount from 0 to about 20 at%, with the tungsten remaining in the composition being not less than 10 at%.

50. A method according to claim 43, wherein said spheres comprise a multi-carbide material consisting essentially of from about 20 to 30 at% carbon; from about 5 to 50 at% titanium; from about 0 to 30 at% of at least a first material from the group consisting of rhenium, zirconium, hafnium and molybdenum; from about 0 to 10 at% of at least a second material taken from the group consisting of vanadium, niobium and tantalum; from about 0 to 20 at% chromium; with the balance, but not less than 10 at%, being tungsten.

51. A method according to claim 43, wherein said spheres comprise a multi-carbide material consisting essentially of:

(a) from about 15 to 60 at% titanium and first alloying substituents, wherein said first alloying substituents consist of hafnium, niobium, tantalum and zirconium; and wherein titanium, titanium and niobium, or titanium and niobium and tantalum are present from 0 to 20 at%; wherein titanium or titanium and zirconium are present from about 0 to 10 at%; and wherein titanium or titanium and hafnium are present from about 0 to 30 at%; and the balance, if any, being titanium;

(b) from about 3 to 47 at% tungsten and second alloying substituents, wherein said second alloying substituents consist of chromium, molybdenum, vanadium, tantalum and niobium; wherein tungsten or tungsten and chromium are present from about 0 to 5 at%; wherein tungsten or tungsten and molybdenum are present from about 0 to 25 at%; wherein tungsten or tungsten and vanadium are present from about 0 to 5 at%; and wherein tungsten, tungsten and tantalum, tungsten and niobium, or tungsten and tantalum and niobium are present from about 0 to 20 at%; and the balance, if any, being tungsten;

(c) carbon from about 30 to 55 at%;

(d) wherein the atomic percentages of niobium and tantalum, each alone or in combination, never exceed 20 at%; and

(e) wherein the total at% of all constituents is 100 at%, all of the constituents of the alloy being of normal commercial purity.

52. A method according to claims 43, 44, 47, 48, 49, 50, or 51, wherein said spheres range in size from 0.5 micron to 100 mm in diameter.

53. A method for making grinding media, comprising the step of forming said media from a multi-carbide material consisting essentially of carbon and one element selected from the group consisting of chromium, hafnium, niobium, tantalum, titanium, tungsten, molybdenum, vanadium, and zirconium, along with the elemental metal of said carbide.

54. A method according to claim 53, further comprising the step of forming said media into shaped media ranging in size from 0.5 micron to 100 mm in diameter.

55. A method according to claim 53, further comprising the step of forming said media into spheres ranging in size from 0.5 micron to 100 mm in diameter.

56. A method for making spheres for use in cladding material, comprising the step of forming said spheres from a multi-carbide material consisting essentially of carbon and one element selected from the group consisting of chromium, hafnium, molybdenum, niobium, rhenium, tantalum, thallium, titanium, tungsten, vanadium, and zirconium, along with the elemental metal of the carbide.

57. A method for making spheres for use in surfacing material, comprising the step of forming said spheres from a multi-carbide material consisting essentially of carbon and one element selected from the group consisting of chromium, hafnium, molybdenum, niobium, rhenium, tantalum, thallium, titanium, tungsten, vanadium, and zirconium, along with the elemental metal of the carbide.

58. A method for making spheres for use in hard body material, comprising the step of forming said spheres from a multi-carbide material consisting essentially of carbon and one element selected from the group consisting of chromium, hafnium, molybdenum, niobium, rhenium, tantalum, thallium, titanium, tungsten, vanadium, and zirconium, along with the elemental metal of the carbide.

59. A method according to claim 56, 57, or 58, wherein said spheres range in size from 0.5 micron to 100 mm in diameter.

60. A method for milling a product in a media mill, comprising the step of using media consisting essentially of a multi-carbide material which consists essentially of carbon and at least two carbide-forming elements wherein said multi-carbide is formed as media for use in a media mill.

61. A method according to claim 60, wherein said carbide-forming elements are selected from the group consisting of chromium, hafnium, molybdenum, niobium, rhenium, tantalum, thallium, titanium, tungsten, vanadium, and zirconium.

62. A method according to claims 60 or 61 wherein said multi-carbide material further includes a carbide-forming element in its elemental state.

63. A method according to claims 60 or 61 wherein said multi-carbide material further includes at least one of said carbide-forming elements of said multi-carbide material in its elemental state.

64. A method according to claim 60, wherein said media consists essentially of titanium, tungsten, and carbon, in the ratios of from about 10 to 90 at% tungsten, from about 2 to 97 at% titanium, and the balance carbon.

65. A method according to claim 60, wherein said media consists essentially of about 10 to 40 at% carbon; from about 5 to 50 at% titanium, and the balance being tungsten.

66. A method according to claim 60, wherein said media comprises:

a multi-carbide material consisting essentially of from about 10 to 40 at% carbon, from about 5 to 50 at% titanium, and the balance being tungsten; and

at least one material taken from the group consisting of molybdenum, chromium, and rhenium;

wherein said at least one material is in an amount from 0 to about 20 at%, with the tungsten remaining in the composition being not less than 10 at%.

67. A method according to claim 60, wherein said media comprises a multi-carbide material consisting essentially of from about 20 to 30 at% carbon; from about 5 to 50 at% titanium; from about 0 to 30 at% of at least a first material from the group consisting of rhenium, zirconium, hafnium and molybdenum; from about 0 to 10 at% of at least a second material taken from the group consisting of vanadium, niobium and tantalum; from about 0 to 20 at% chromium; with the balance, but not less than 10 at%, being tungsten.

68. A method according to claim 60, wherein said media comprises a multi-carbide material consisting essentially of:

(a) from about 15 to 60 at% titanium and first alloying substituents, wherein said first alloying substituents consist of hafnium, niobium, tantalum and zirconium; and

wherein titanium, titanium and niobium, or titanium and niobium and tantalum are present from 0 to 20 at%; wherein titanium or titanium and zirconium are present from about 0 to 10 at%; and wherein titanium or titanium and hafnium are present from about 0 to 30 at%; and the balance, if any, being titanium;

(b) from about 3 to 47 at% tungsten and second alloying substituents, wherein said second alloying substituents consist of chromium, molybdenum, vanadium, tantalum and niobium; wherein tungsten or tungsten and chromium are present from about 0 to 5 at%; wherein tungsten or tungsten and molybdenum are present from about 0 to 25 at%; wherein tungsten or tungsten and vanadium are present from about 0 to 5 at%; and wherein tungsten, tungsten and tantalum, tungsten and niobium, or tungsten and tantalum and niobium are present from about 0 to 20 at%; and the balance, if any, being tungsten;

(c) carbon from about 30 to 55 at%;

(d) wherein the atomic percentages of niobium and tantalum, each alone or in combination, never exceed 20 at%; and

(e) wherein the total at% of all constituents is 100 at%, all of the constituents of the alloy being of normal commercial purity.

69. A method according to claims 60, 61, 64, 65, 66, 67, or 68, further comprising the step of forming said media into shaped media ranging in size from 0.5 micron to 100 mm in diameter.

70. A method according to claims 60, 61, 64, 65, 66, 67, or 68, further comprising the step of forming said media into spheres ranging in size from 0.5 micron to 100 mm in diameter.

71. A method for milling a product in a media mill, comprising the step of using carbide media consisting essentially of carbon and one element selected from the group consisting of chromium, hafnium, molybdenum, niobium, rhenium, tantalum, thallium, titanium, tungsten, vanadium, and zirconium, along with the elemental metal of the carbide.

72. A method according to claim 71, wherein said media is formed into shaped media ranging in size from 0.5 micron to 100 mm in diameter.

73. A method according to claim 71, wherein said media is formed into spheres ranging in size from 0.5 micron to 100 mm in diameter.

74. Grinding media of any geometry consisting essentially of multiple carbide-forming elements, with carbon, having a density greater than 8 gm/cc and a combination of hardness and toughness sufficient to permit use in a media mill without contamination of the milled product to an amount greater than 300 ppm.

75. Grinding media according to claim 74 further including a carbide-forming element in its elemental state.

76. Grinding media according to claim 74 further including at least one of said carbide-forming elements in its elemental state.